charge in the electric field between earth and cloud ; these projections have not featured in experiments hitherto.

Some time ago, one of us had occasion to study the discharge of an impulse generator delivering 1,000,000 volts to a point-plane gap ; it was noticed then that all positive impulses applied to the point—the plane being connected to earth—showed branching from the point ; all negative impulses showed branching from the plane. Clearly asymmetry of the gap was insufficient to produce branching from the negative point. On raising a short projection out of the earthed plane, branching occurred from the high voltage point when positive, but in addition there was marked branching from the projection, that is, from the negative point. We have recently had further opportunity of continuing experiments on these lines ; confining our attention to the case when the high voltage point was negative, we created a positive space charge above the plane by erecting from it a comb of short nails. From most of these proceeded short streamers branching upwards, whilst from the negative point the main discharge to ground was accompanied by many side branches forking downwards, as illustrated in Fig. 2. Negative corona is

FIG. 3.

seen extending for a short distance from the electrode above the discharge, and positive branching is seen above the nails—St. Elmo's Fire. Thus, provided the conditions are correct, negative branching of a magnitude comparable with positive branching can be produced, and we have a ready explanation of the branched discharges from negative clouds. This throws fresh light on the mechanism of the discharge, and further investigations are proceeding.

Fig. 3 is an oscillogram of the impulse applied to the point ; the voltage applied reaches a maximum of 10^6 volts in $\frac{1}{4}$ microsec., remains at that figure without oscillations for 9 microsec., and decays as the discharge passes to ground in $\frac{1}{4}$ microsec. The polarity of the discharge is given by the oscillograms and also by a polarity indicator on the impulse generator. The current in the discharge is about 1000 amperes.

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Atoms and Molecules as Fitzgerald Oscillators.

IN his studies on the polarisation of scattered radiations, Bhagavantam,¹ besides recording numerous cases in which the displaced lines in the spectrum of the light transversely scattered by liquids exhibit complete depolarisation, also discovered in the case of sulphur trioxide liquid an anomalously polarised line. The depolarisation of this line exceeded unity ; in other words, the horizontal component, instead of being weaker, as in normally polarised lines, was actually stronger than the vertical component. Critical and systematic investigations undertaken by S. Venkateswaran definitely confirm the existence of such anomalous polarisation in the spectra of light-scattering by various organic liquids, and indicate that it is by no means an unusual phenomenon.

The maximum depolarisation which a rotating electric dipole or Hertzian doublet can yield is $6/7$ or $3/4$ according as the incident light is common or plane polarised. It would seem, therefore, that we have to seek in some new direction for an explanation of the large depolarisations and anomalous polarisations so frequently encountered in light-scattering. It is proposed in this note to put forward, with all reserve, the suggestion that an atom or molecule scattering light may, in certain cases, function as a Fitzgerald oscillator or magnetic doublet. As electrons and nuclei in atoms and molecules are known to possess magnetic moments, there is nothing inherently improbable in this idea, and it offers an immediate explanation of 'anomalous polarisation' in light-scattering. For what is 'normal' polarisation for an electric oscillator is 'anomalous' for a magnetic oscillator, and vice versa.

A test of this idea is furnished by working with polarised incident light, and finding how a variation of its plane of polarisation affects the intensity of the given line in the spectrum. The conditions for maximum and minimum intensity for a Fitzgerald oscillator are the reverse of what they would be for a Hertzian doublet, the intensity of the line being a maximum when the magnetic force instead of the electric vector in the incident light is perpendicular to the direction of observation, and a minimum in the converse case. Venkateswaran has found liquid thiophene to be an excellent example of a substance which simultaneously gives 'normally polarised', 'unpolarised', and 'anomalously polarised' lines, and is, therefore, very suitable for the experiments. Polarising the incident light, and varying its plane of polarisation, he has discovered that 'normally' polarised lines show maximum intensity, while 'anomalously' polarised lines give minimum intensity, and vice versa.

The hypothesis that atoms and molecules may function as magnetic oscillators appears, therefore, to receive support from experiment. It should be remarked, however, that anomalous polarisation may also be explained as due to radiation from electric quadrupoles.

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¹ *Ind. Jour. Phys.*, 5, 59 and 603 ; 1930.

The Jumping Negative Glow.

I FIRST observed the jumping negative glow in December 1929, in 'I' type Osgilby tubes of special design supplied by the Research Department of the General Electric Company ; the effect was demonstrated to the Physical Society on Dec. 13, 1929, and at the Royal Institution soirée on Jan. 24 of this year.

Afterwards it was found that Taylor had observed